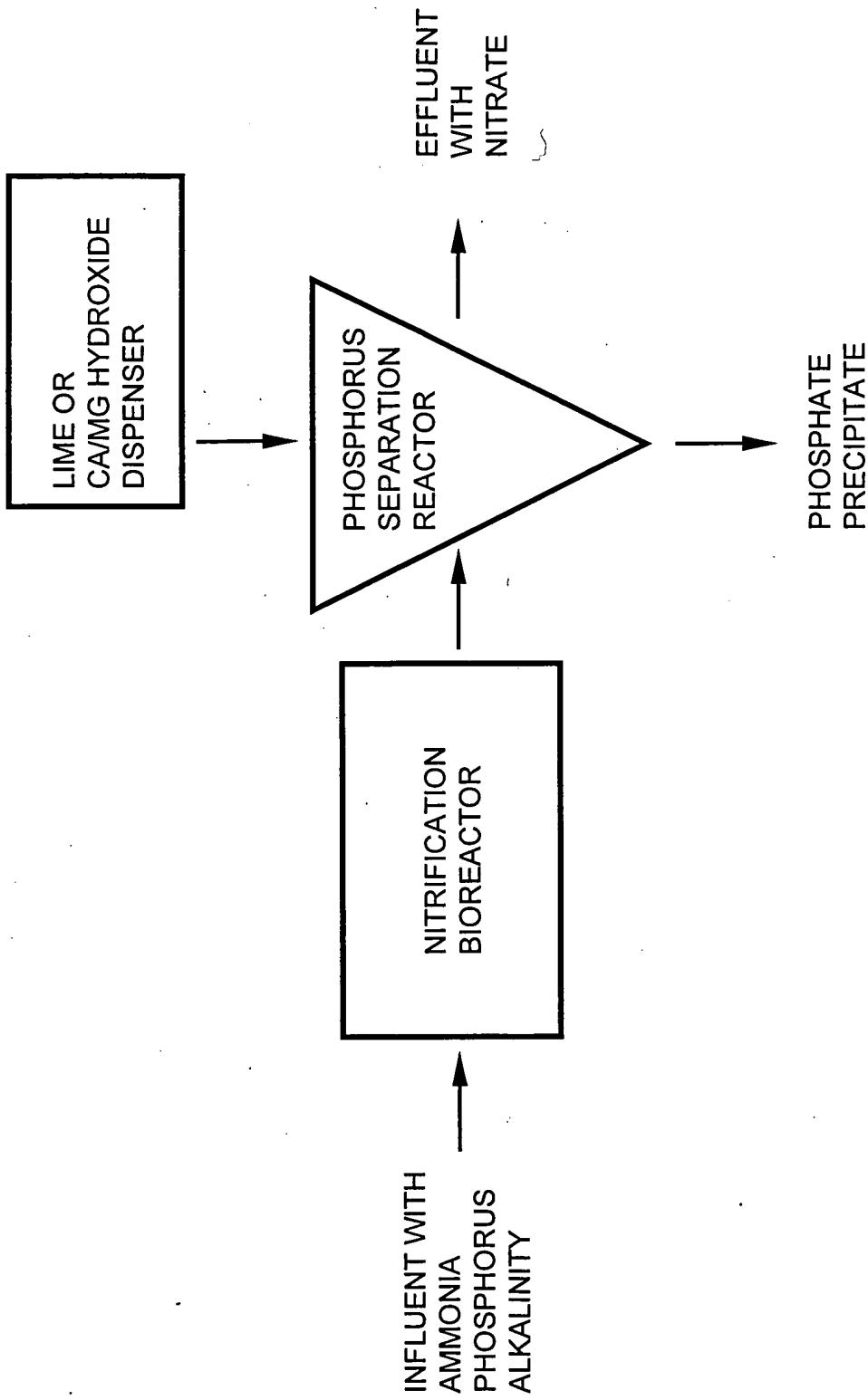


FIG. 1



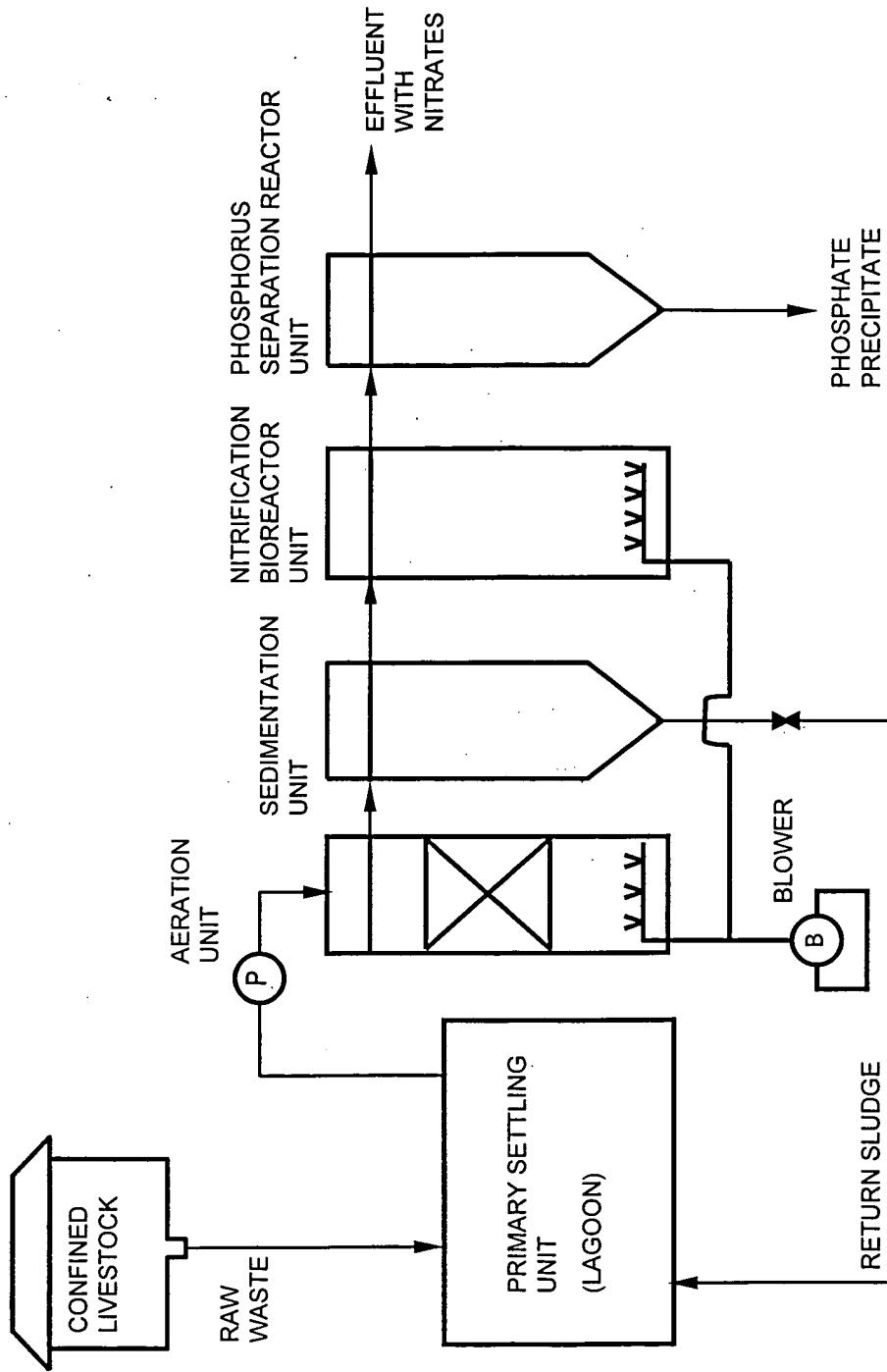
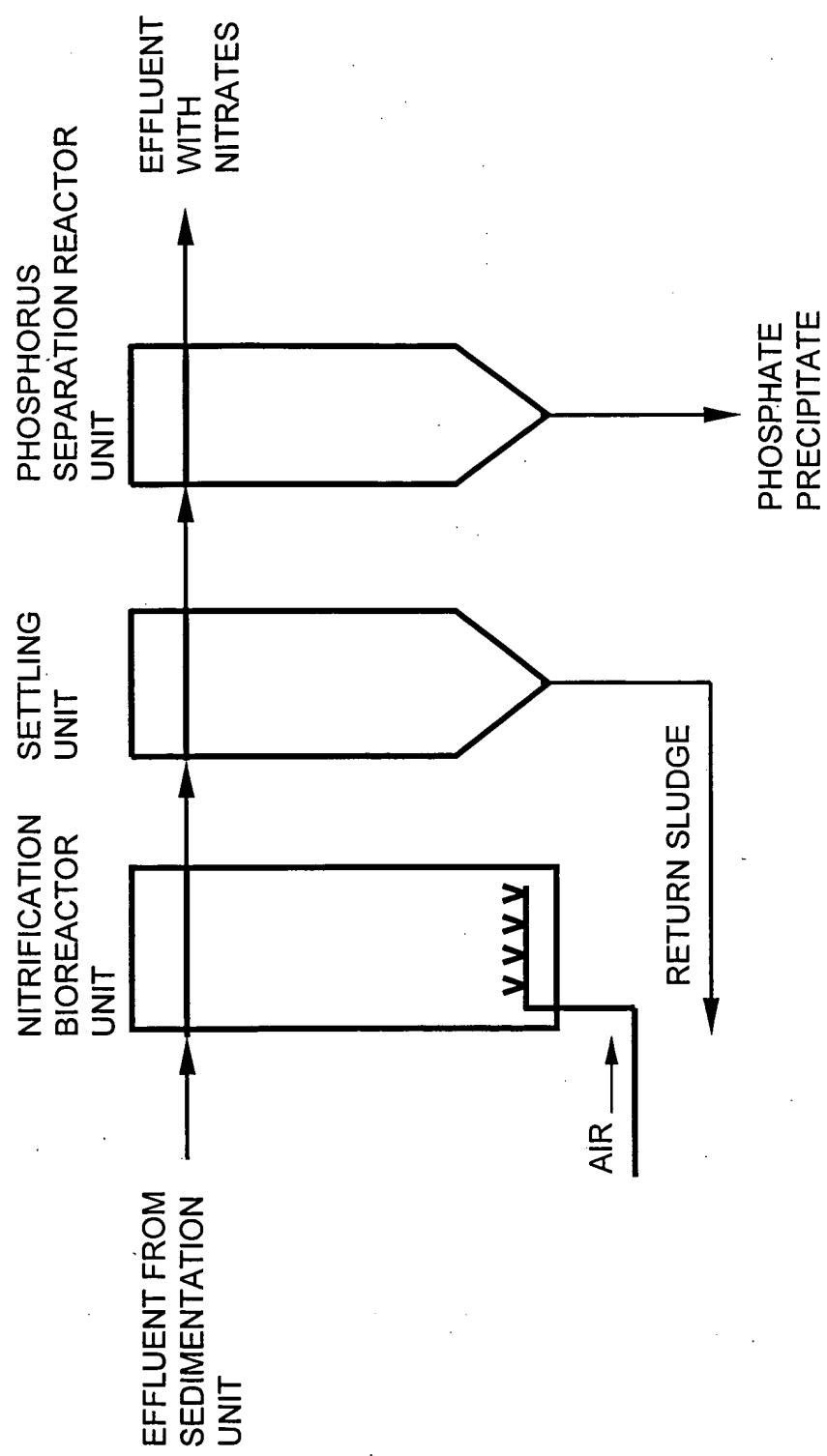


FIG. 2

FIG. 3



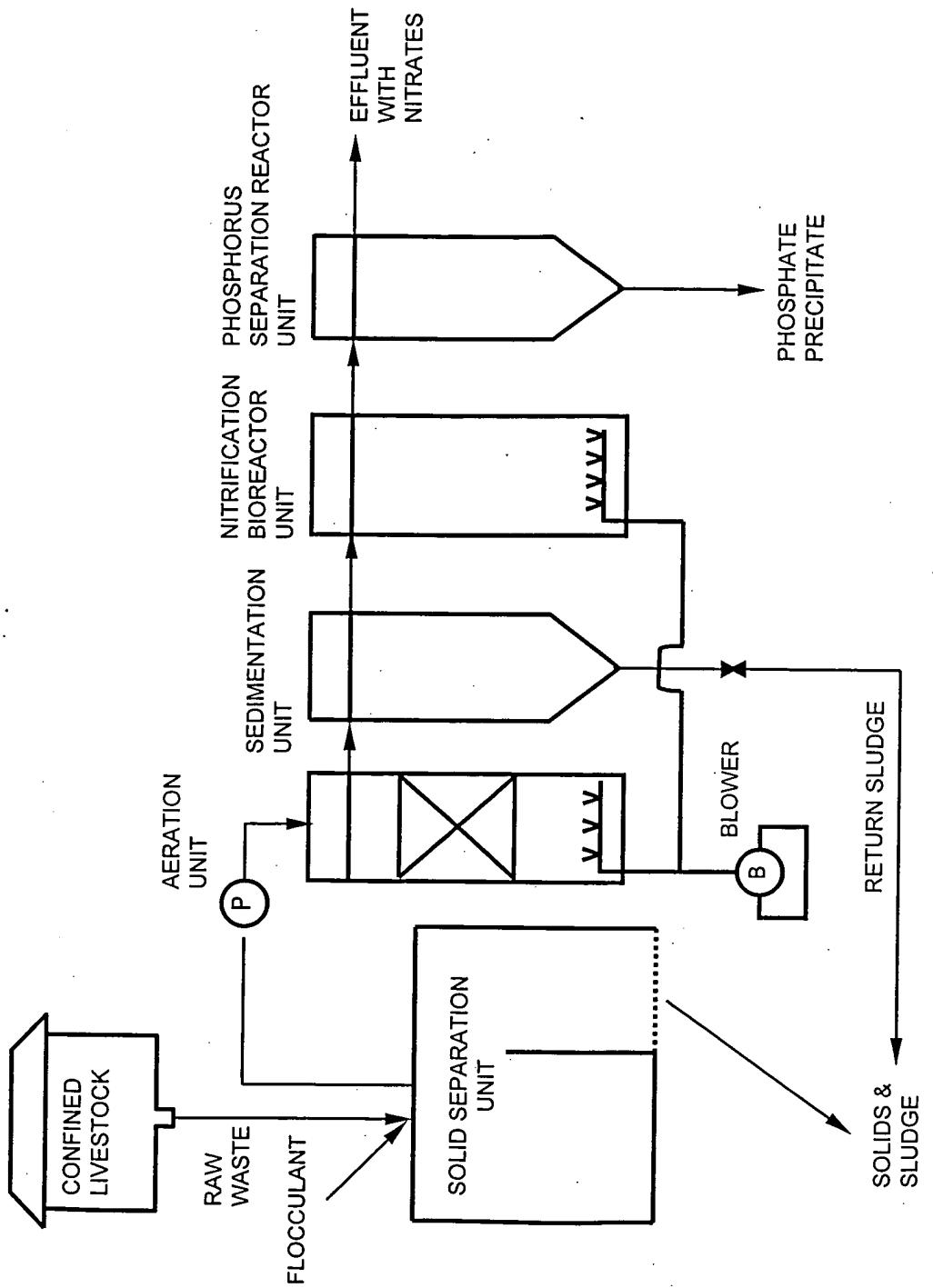


FIG. 4

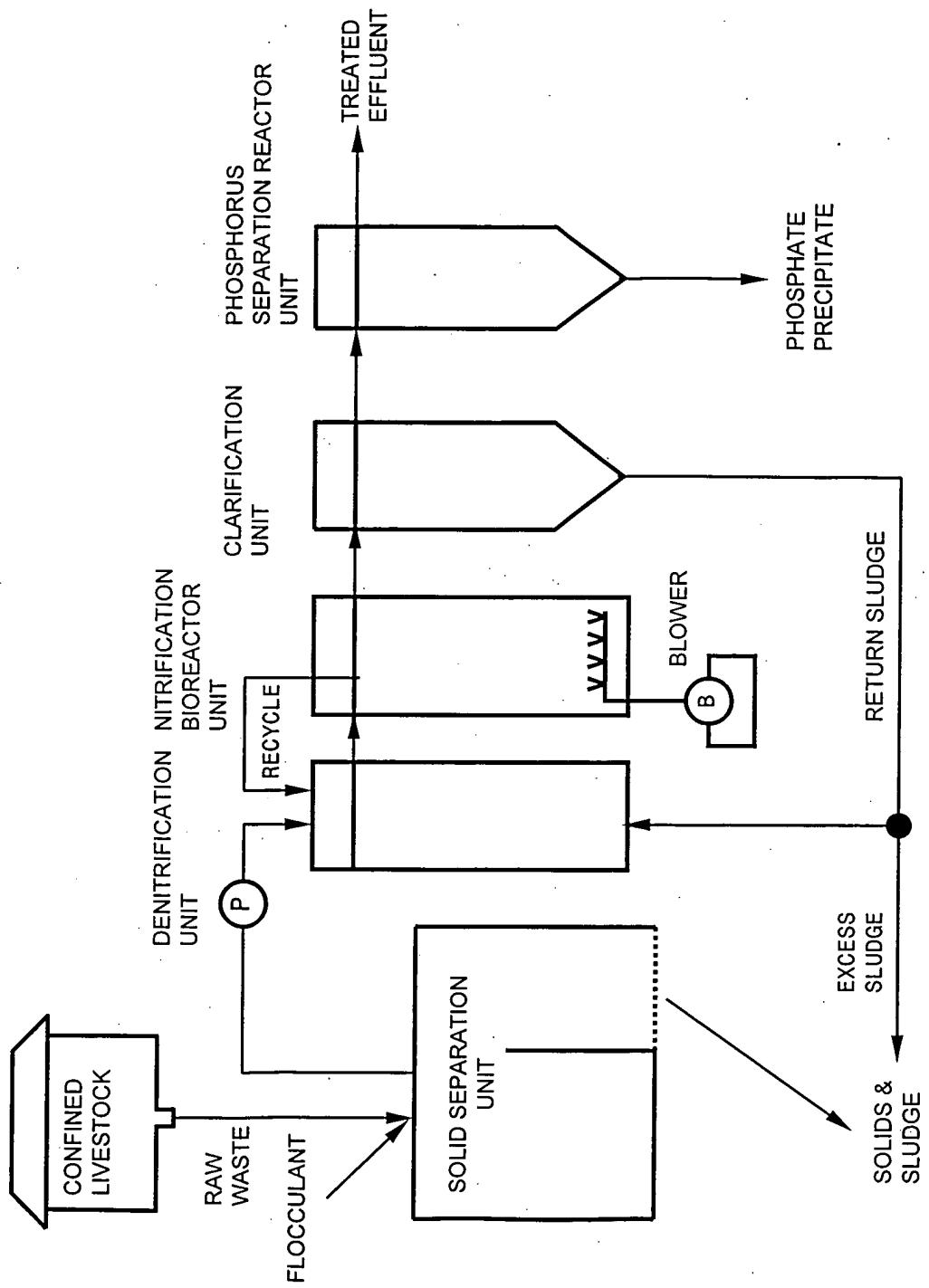


FIG. 5

EFFECT OF ALKALI ADDITION ON pH OF SWINE WASTEWATER THAT RECEIVED NITRIFICATION PRETREATMENT VS. CONTROL

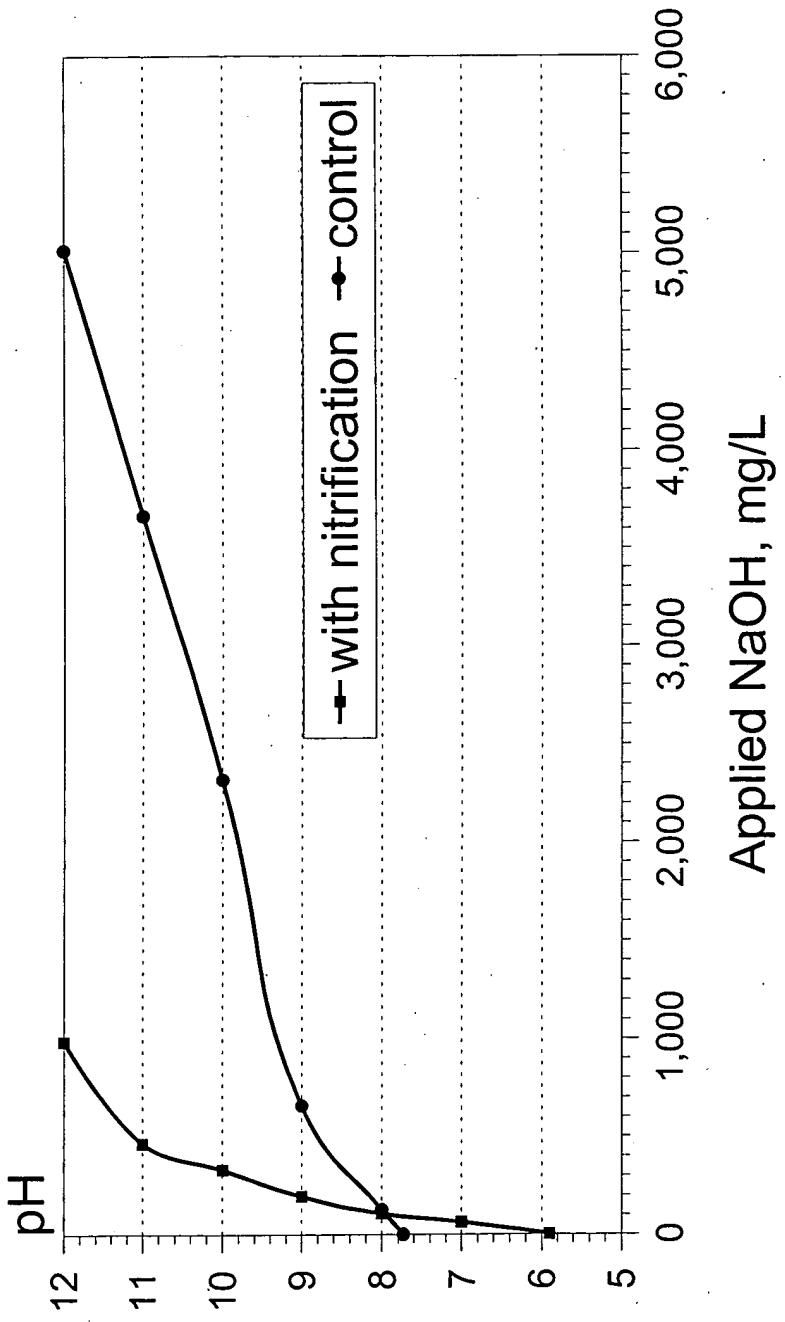
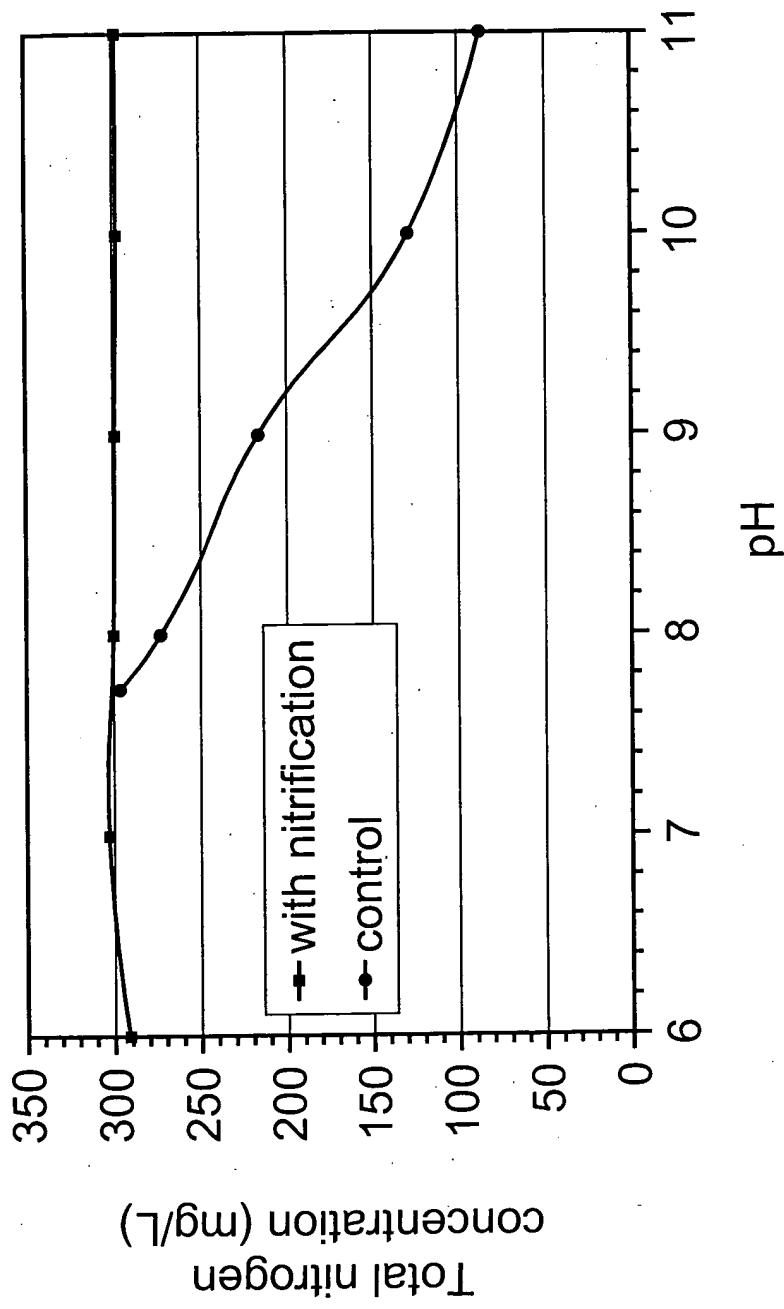


FIG. 6

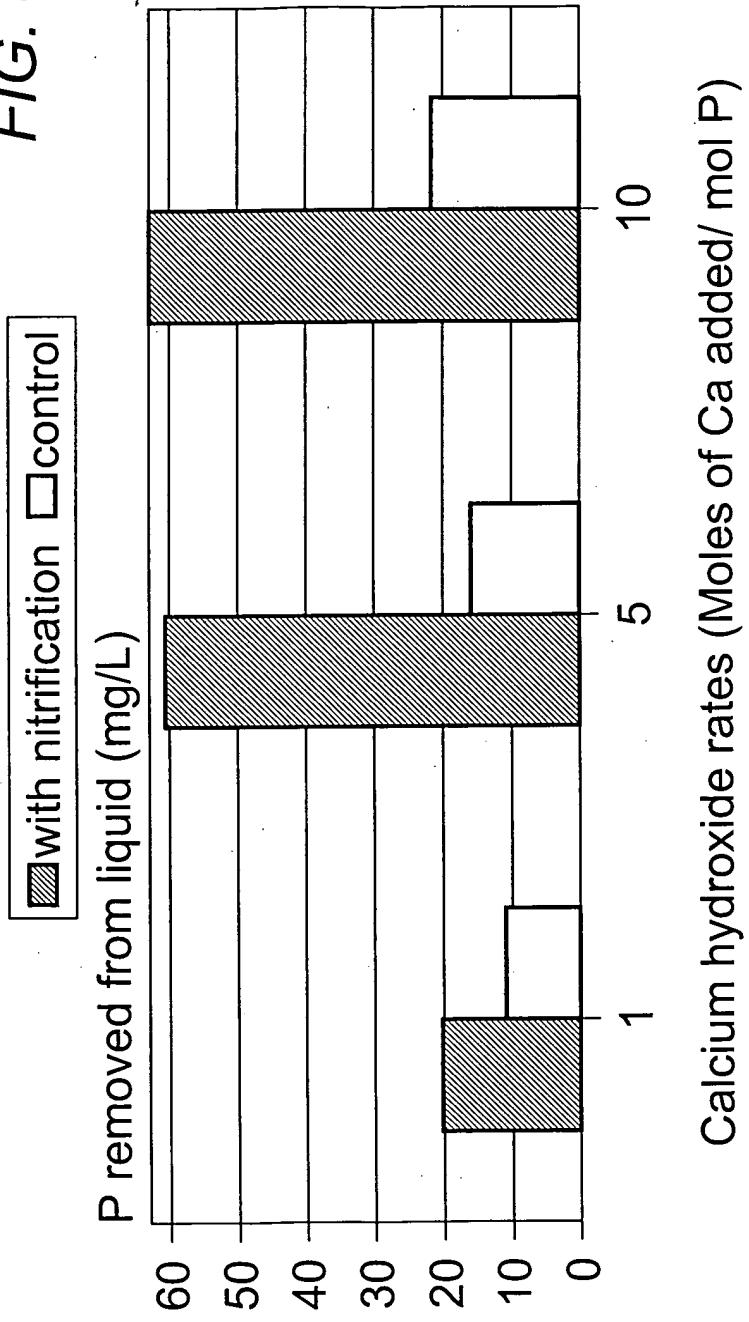
Nitrogen losses in swine wastewater
by ammonia volatilization

FIG. 7



Phosphorus removal from swine wastewater
using Calcium Hydroxide

FIG. 8



Initial conditions:

$\text{PO}_4\text{-P} = 63 \text{ mg/L}$, $\text{pH} = 8.05$, alkalinity = 1890 mg/L , $\text{NH}_4\text{-N} = 300 \text{ mg/L}$

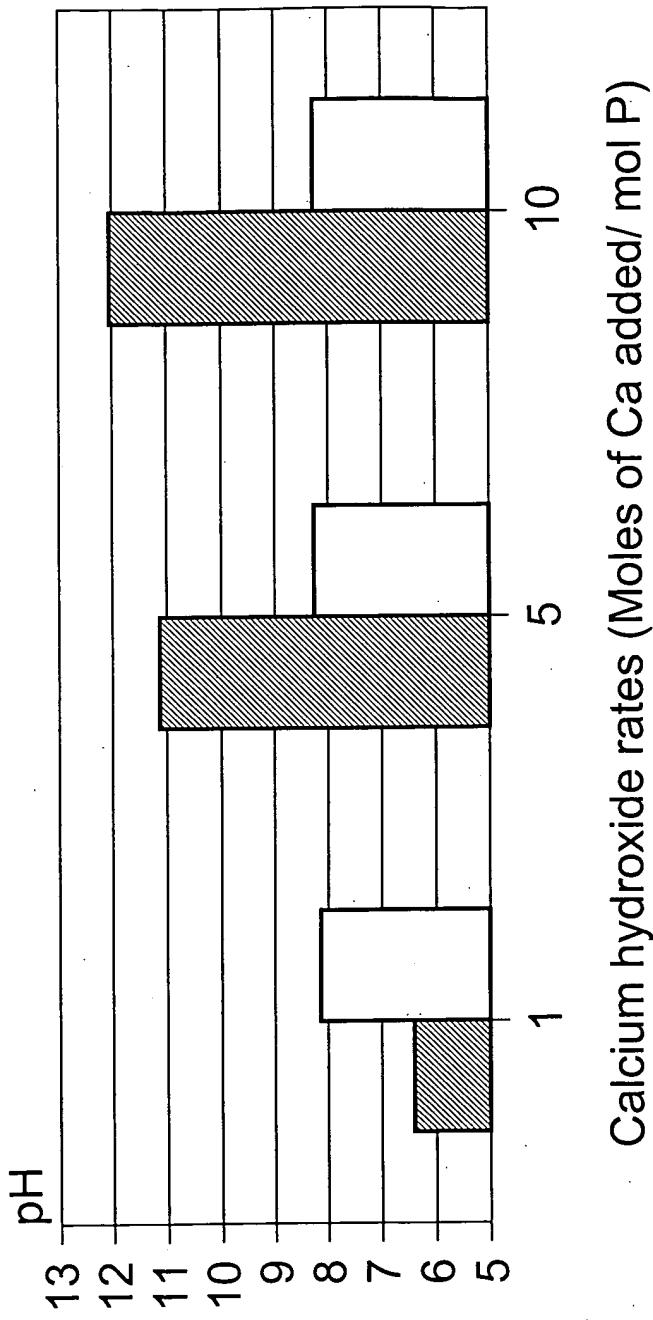
After nitrification:

$\text{PO}_4\text{-P} = 63 \text{ mg/L}$, $\text{pH} = 6.06$, alkalinity = 63 mg/L , $\text{NH}_4\text{-N} = 61 \text{ mg/L}$

Phosphorus removal from swine wastewater
using Calcium Hydroxide: effect on pH

F/G. 9

■ with nitrification □ control



Initial conditions:

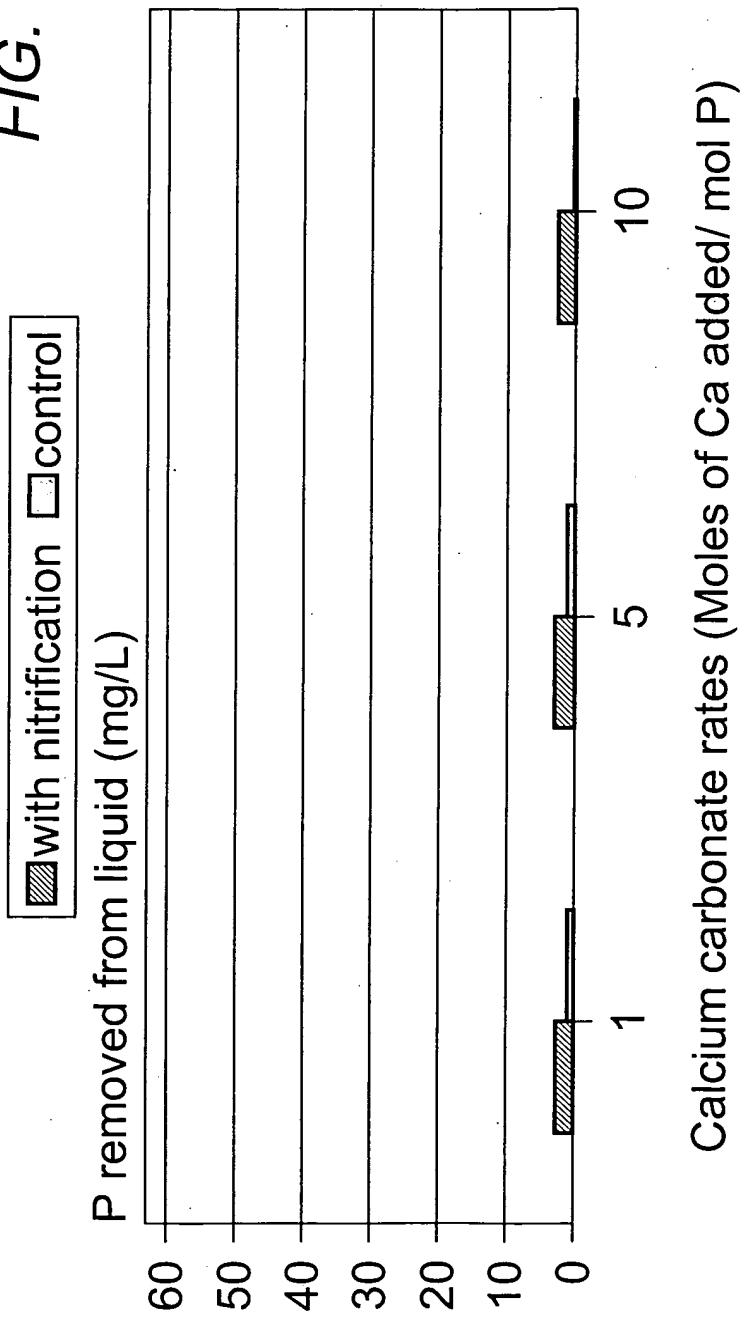
$\text{PO}_4\text{-P} = 63 \text{ mg/L}$, $\text{pH} = 8.05$, alkalinity = 1890 mg/L, $\text{NH}_4\text{-N} = 300 \text{ mg/L}$

After nitrification:

$\text{PO}_4\text{-P} = 63 \text{ mg/L}$, $\text{pH} = 6.06$, alkalinity = 63 mg/L, $\text{NH}_4\text{-N} = 61 \text{ mg/L}$

Use of Calcium Carbonate Lime was not effective
for removal of phosphorus from swine wastewater

FIG. 10



Initial conditions:

$\text{PO}_4\text{-P} = 63 \text{ mg/L}$, $\text{pH} = 8.05$, alkalinity = 1890 mg/L , $\text{NH}_4\text{-N} = 300 \text{ mg/L}$

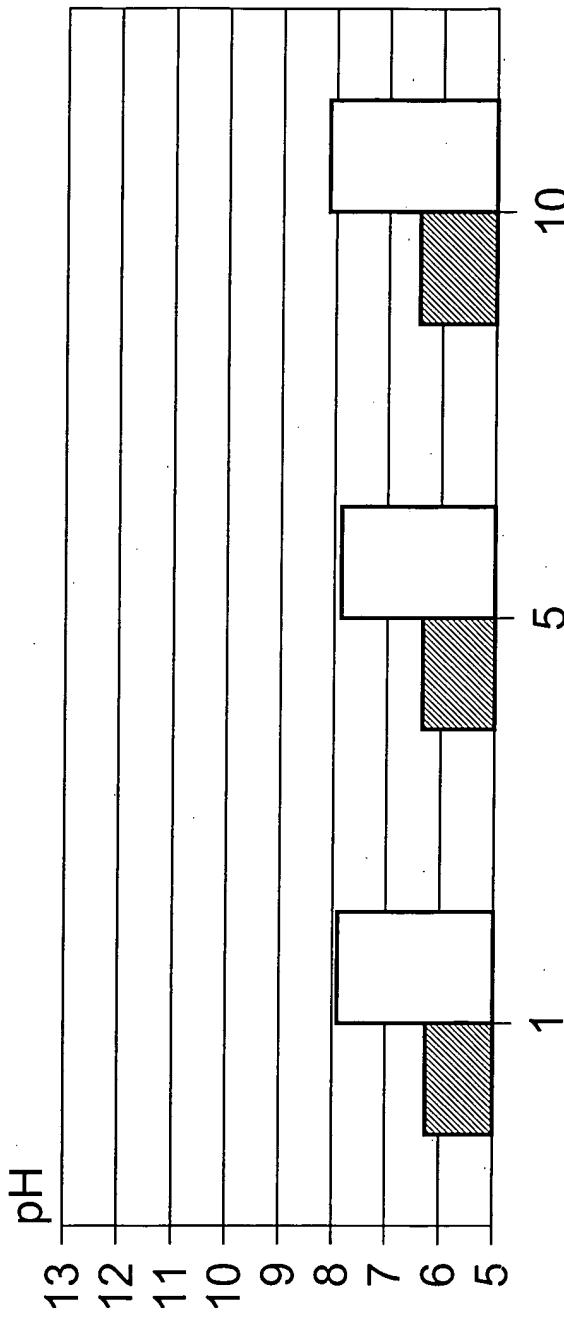
After nitrification:

$\text{PO}_4\text{-P} = 63 \text{ mg/L}$, $\text{pH} = 6.06$, alkalinity = 63 mg/L , $\text{NH}_4\text{-N} = 61 \text{ mg/L}$

Application of Carbonate lime to swine wastewater
did not affect pH or phosphorus removal.

FIG. 11

■ with nitrification □ control



Calcium carbonate rates (Moles of Ca added/ mol P)

Initial conditions:

$\text{PO}_4\text{-P} = 63 \text{ mg/L}$, $\text{pH} = 8.05$, alkalinity = 1890 mg/L, $\text{NH}_4\text{-N} = 300 \text{ mg/L}$

After nitrification:

$\text{PO}_4\text{-P} = 63 \text{ mg/L}$, $\text{pH} = 6.06$, alkalinity = 63 mg/L, $\text{NH}_4\text{-N} = 61 \text{ mg/L}$